



FM Approvals
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Member of the FM Global Group

CERTIFICATE OF COMPLIANCE

HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

BA454Da Batch Controller

IS / I, II, III / 1 / ABCDEFG / T4 Ta = 60°C – CI450-12; Entity; Type 4X, IP66
 I / 0 / AEx ia IIC T4 Ta = 60°C – CI450-12; Entity; Type 4X, IP66
 NI / I, II, III / 2 / ABCDEFG / T4 Ta = 60°C – CI450-13; NIFW; Type 4X, IP66
 I / 2 / IIC / T4 Ta = 60°C – CI450-13; NIFW; Type 4X, IP66

Intrinsic Safety Parameters Input Parameters

Terminals	Vmax (V)	I _{max} (mA)	Pi (W)	Ci (nF)	Li (uH)
1 & 2	28	96	0.84	15	8
11 & 12	0	0	0	15	8
13, 14, 15, 16 & 17	28	100	0.66	18	20
18, 19 & 20	0	0	0	3.6	0
S1 to S7	0	0	0	0.54	300
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	28	200	0.85	0.04	20

Output Parameters

Terminals	Voc (V)	Isc	Po (W)	Co (μF)	Lo (mH)
11 & 12	10.6	20mA	0.05	2.3	90
13, 14, 15, 16 & 17	1.1	0.12mA	<0.001	0.018	0.02
18, 19 & 20	11.7	2.4mA	0.007	1000	1000
S1 to S7	14.7	146.7mA	0.58	0.08	1.1
A1 & A2; A3 & A4 A5 & A6; A7 & A8; A9 & A10; A11 & A12	1.49	1uA	0.003	1000	1000

Nonincendive Field Wiring Parameters

Input Parameters

Terminals	Vmax (V)	I _{max} (mA)	Pi (W)	Ci (nF)	Li (uH)
1 & 2	28	-	-	15	8
13, 14, 15, 16 & 17	28	-	-	18	20
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	32	-	-	40	20

Output Parameters

Terminals	Voc (V)	Isc (mA)	Po (W)	Co (μF)	Lo (mH)
S1 to S7	14.7	146.7	-	0.08	1.1
11 & 12	10.6	20	-	2.3	90
18, 19 & 20	11.7	2.4	-	1000	1000

a = Parameter not affecting safety.

Special conditions of use

1. The BA454D shall be protected from direct exposure to sunlight.
2. Input connections shall only be made to terminals 11 and 12 or to terminals 13, 14, 15, 16 and 17. These inputs shall not be used at the same time.

BA458Ca Batch Controller

IS / I / 1 / ABCD / T4 Ta = 60°C – CI450-12; Entity: Type 4X*, IP66*

I / 0 / AEx ia IIC T4 Ta = 60°C – CI450-12; Entity: Type 4X*, IP66*

NI / I / 2 / ABCD / T4 Ta = 60°C – CI450-13; NIFW; Type 4X*, IP66*

I / 2 / IIC / T4 Ta = 60°C – CI450-13; NIFW; Type 4X*, IP66*

*Front panel only

Intrinsic Safety Parameters

Input Parameters

Terminals	V _{max} (V)	I _{max} (mA)	P _i (W)	C _i (nF)	L _i (uH)
1 & 2	28	96	0.84	15	8
11 & 12	0	0	0	15	8
13, 14, 15, 16 & 17	28	100	0.66	18	20
18, 19 & 20	0	0	0	3.6	0
S1 to S7	0	0	0	0.54	300
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	28	200	0.85	0.04	20

Output Parameters

Terminals	V _{oc} (V)	I _{sc}	P _o (W)	C _o (μF)	L _o (mH)
11 & 12	10.6	20mA	0.05	2.3	90
13, 14, 15, 16 & 17	1.1	0.12mA	<0.001	0.018	0.02
18, 19 & 20	11.7	2.4mA	0.007	1000	1000
S1 to S7	14.7	146.7mA	0.58	0.08	1.1
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	1.49	1uA	0.003	1000	1000

Nonincendive Field Wiring Parameters

Input Parameters

Terminals	V _{max} (V)	I _{max} (mA)	P _i (W)	C _i (nF)	L _i (uH)
1 & 2	28	-	-	15	8
13, 14, 15, 16 & 17	28	-	-	18	20
A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12	32	-	-	40	20

Output Parameters

Terminals	U _o (V)	I _o (mA)	P _o (W)	C _o (μF)	L _o (mH)
S1 to S7	14.7	146.7	-	0.08	1.1
11 & 12	10.6	20	-	2.3	90
18, 19 & 20	11.7	2.4	-	1000	1000

a = Parameter not affecting safety.

Special conditions of use

1. To maintain the Type 4X enclosure rating the BA45C shall be installed in accordance with the mounting conditions provided on drawing numbers CI450-12 and CI450-13.
2. The BA488C shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application.
3. The BA488C shall be protected from direct exposure to sunlight.
4. Input connections shall only be made to terminals 11 and 12 or to terminals 13, 14, 15, 16 and 17. These inputs shall not be used at the same time.

Equipment Ratings:

BA454D Batch Controller

Intrinsically Safe for Class I, II and III, Division 1, Groups A, B, C, D, E, F and G and Class I, Zone 0 Group IIC indoor and outdoor Hazardous Locations in accordance with the Entity Concept when installed according to Control Drawing CI450-12. Nonincendive for Class I and II Division 2, Groups A, B, C, D, E, F and G; Nonincendive for Class III, Divisions 1 and 2; Nonincendive Class I Zone 2 Groups IIC indoor and outdoor Hazardous Locations in accordance with the NIFW Concept when installed according to Control Drawing CI450-13. Temperature Class T4 at an ambient of 60°C

BA458C Batch Controller

Intrinsically Safe for Class I, II and III, Division 1, Groups A, B, C, and D, and Class I, Zone 0 Group IIC indoor and outdoor Hazardous Locations in accordance with the Entity Concept when installed according to Control Drawing CI450-12. Nonincendive for Class I, Division 2, Groups A, B, C, and D; Nonincendive Class I Zone 2 Groups IIC indoor and outdoor Hazardous Locations in accordance with the NIFW Concept when installed according to Control Drawing CI450-13. Temperature Class T4 at an ambient of 60°C

FM Approved for:

BEKA associates Limited
Hitchin, United Kingdom

This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

Class 3600	1998
Class 3610	1999
Class 3611	2004
Class 3810	2005
NEMA 250	1991
ANSI/IEC 60529	2004

Original Project ID: 3033262

Approval Granted: *August 28, 2009*

Subsequent Revision Reports / Date Approval Amended

Report Number	Date	Report Number	Date
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FM Approvals LLC



J. E. Marquedant
Group Manager, Electrical

28 August 2009

Date

UNCLASSIFIED LOCATION

HAZARDOUS (CLASSIFIED) LOCATION

DO NOT SCALE

DIMENSIONS IN mm

THIRD ANGLE PROJECTION



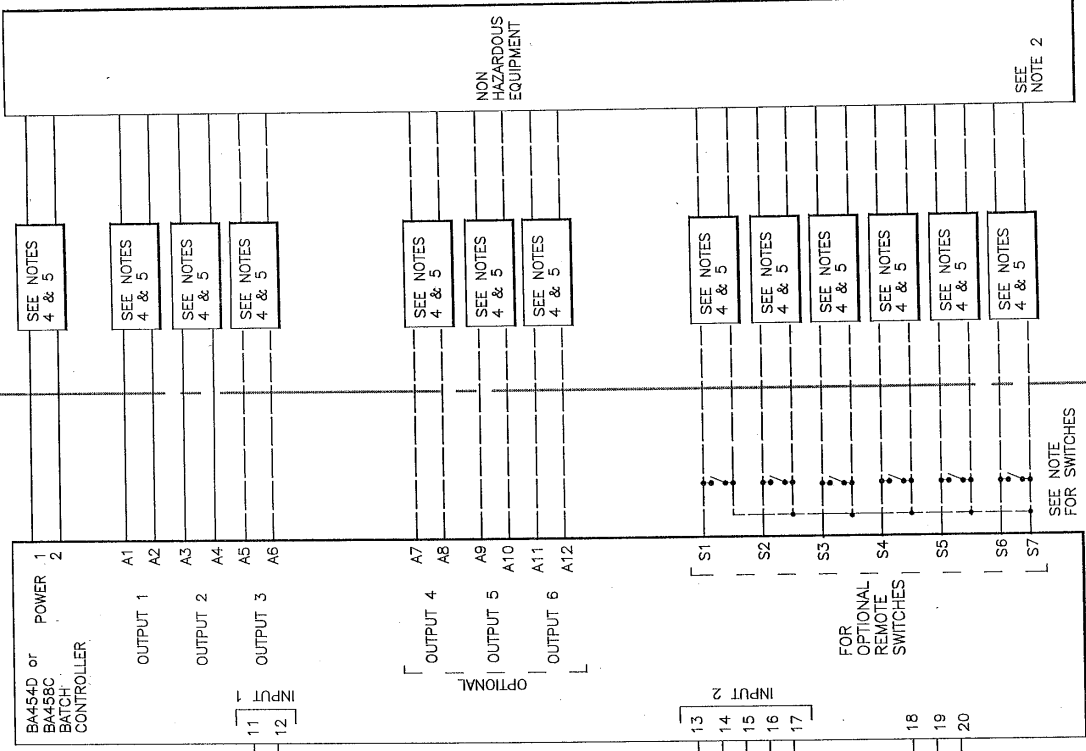
SEE NOTE 1

HAZARDOUS LOCATIONS:
 BA454D
 Class I, Division 1, Groups A, B, C, D
 Class II, Division 1, Groups E, F & G
 Class III
 Class I, Zone 0, Group IIC

BA458C LOCATIONS:
 Class I, Division 1, Groups A, B, C, D
 Class II, Zone 0, Group IIC

BA454D and BA458C Entity Parameters	
Terminals 1 & 2	
U _i = 28V	I _o = 96mA
P _i = 0.84W	C _i = 15nF
L _i = 8μH	
Terminals S1 to S7 (combined parameters)	
U _o = 14.7V dc	I _o = 146.7mA dc
P _i = 0	P _o = 0.58W
C _i = 0.54μF	C _o = 0.08μF
L _i = 0.3mH	L _o = 1.1mH
Terminals A1 & A2; A3 & A4; A5 & A6; A7 & A8; A9 & A10; A11 & A12 (for each output)	
U _i = 28V dc	U _o = 1.49V dc
I _i = 200mA dc	I _o = 1μA dc
P _i = 0.85W	P _o = 3μW
C _i = 0.04μF	C _o = 1000μF
L _i = 0.02mH	L _o = 1000mH
Terminals 11 & 12	
U _o = 10.6V	I _o = 20mA
P _i = 0	P _o = 50mW
C _i = 15nF	C _o = 2.3μF
L _i = 8μH	L _o = 90mH
Terminals 13, 14, 15, 16 & 17	
U _i = 28V dc	U _o = 1.1V
I _i = 100mA	I _o = 0.12mA
P _i = 0.66W	P _o = 35μW
C _i = 18nF	C _o = 0.18μF
L _i = 20mH	L _o = 0.02mH
Terminals 18, 19 & 20	
U _i = 0	U _o = 11.7V
I _i = 0	I _o = 2.4mA
P _i = 0	P _o = 7mW
C _i = 3.6nF	C _o = 1000μF
L _i = 0	L _o = 1000mH

***** NOTE: *****
 * No modification to be made without *
 * reference/approval from FM Approvals *
 * and BEKA associates Design Department. *



"Input connections shall only be made to terminals 11 and 12 (INPUT 1), or to terminals 13, 14, 15, 16 and 17 (INPUT 2). These inputs shall not be used at the same time."

INPUT IN HAZARDOUS (CLASSIFIED) LOCATION

1	26.03 2008	First release						Drawn	SH	Checked	Scale	NTS
												Drawing No. C1450-12
												Sheet 1 of 4
												File No C1450-12s1 26.06.09
iss.	Date	Modification	Ckd.	Appd.	Title FM Approvals Control Drawing for intrinsically safe BA454D & BA458C Batch Controller							

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SUB-MASTER

HAZARDOUS (CLASSIFIED) LOCATION

UNCLASSIFIED LOCATION

BA454D OR
BA458C
BATCH
CONTROLLER

11
12
INPUT 1

INPUT
1 OR 2
"Input connections shall only be made to terminals 11 and 12 (INPUT 1), or to terminals 13, 14, 15, 16 and 17 (INPUT 2). These inputs shall not be used at the same time."

13
14
15
16
17
INPUT 2

SEE NOTES
4 & 5

NON
HAZARDOUS
EQUIPMENT

SEE NOTES
4 & 5

SEE NOTE 2

INPUT IN UNCLASSIFIED LOCATION

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Iss.	04 2008	Modification First release	Appd.	Ckd.	Modifcation	Date
Iss.	1					

Title
 FM Approvals Control Drawing for
 intrinsically safe BA454D & BA458C
 Batch Controller

Drawn RC	Checked 	Scale NTS
Drawing No. Sheet 2		CI450-12

SUB-MASTER

 Note: No modification to be made without reference/approval from FM Approvals and BEKA associates Design Department.

Notes:

1. The associated intrinsically safe barriers and galvanic isolators must be FM approved and the manufacturers' installation drawings shall be followed when installing this equipment.
 For installations in Canada the associated intrinsically safe barriers and galvanic isolators must be cFM or CSA approved and the manufacturers' installation drawings shall be followed when installing the equipment.
2. The unclassified location equipment connected to the associated intrinsically safe Zener barriers or galvanic isolators shall not use or generate more than 250V rms or 250V dc.
3. Installation shall be in accordance with ANSI/ISA RP 12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code ANSI/NFPA 70. Installations in Canada shall be in accordance with the Canadian Electrical Code C22.1
4. One single channel or one channel of a dual channel associated intrinsically safe barrier or galvanic isolator with entity parameters complying with the following requirements:

Uo or Vt	equal to or less than	Ui
Io or It	equal to or less than	Ii
Lo	equal to or greater than	Lcable + Li
Co	equal to or greater than	Ccable + Ci
5. All shunt Zener diode safety barriers and diode return barriers must be of like polarity.
6. The electrical circuit and the interconnecting cables in the hazardous (classified) location must be cable of withstanding an ac test voltage of 500Vrms to ground or frame of the apparatus for one minute.
7. Hazardous (classified) location equipment may be simple apparatus as defined in the National Electrical Code or the Canadian Electrical Code e.g. mechanically activated switches OR FM Approved equipment with entity parameters complying with following requirements:

Uo or Vt	equal to or less than	Ui
Io or It	equal to or less than	Ii
Lo	equal to or greater than	Lcable + Li
Co	equal to or greater than	Ccable + Ci

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Iss.	Date	Modification	Ckd.	Appd.
1	26.03 2008	First release		

Title FM Approvals Control Drawing for intrinsically safe BA454D & BA458C Batch Controller	Drawn RC	Checked 	Scale NTS
Drawing No. Sheet 3		CI450-12	

Iss.		Date		Modification		Ckd.		Appd.	
1		26.03 2008		First release					

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8. Optional switches which comply with the requirements for simple apparatus as defined in the National Electrical Code or the Canadian Electrical Code.
9. To maintain IP66 protection between the BA458C batch controller and the mounting panel:
- Four panel mounting clips shall be used
 - Minimum panel thickness shall be 2mm (0.08inches) Steel
 3mm (0.12inches) Aluminium
 - Outside panel finish shall be smooth, free from particle inclusions, around cut-out.
 - Panel cut-out shall be 66.2 x 136.0mm -0.0 +0.5
 (2.60 x 5.35 inches -0.00 +0.02)
 - Edges of panel cut-out shall be deburred and clean
 - Each panel mounting clip shall be tightened to between: 20 and 22cNm (1.77 to 1.95 inLb)

10. When installed in a hazardous (classified) location the BA454D Batch Controller shall be fitted with cable glands/conduit hubs selected from the following table
- Metallic glands and hubs must be grounded - see note 11.

Class	Permitted gland or conduit hub
Class I	Any metallic or plastic cable gland or conduit hub that provides the required environmental protection.
Class II and III	<p>Crouse - Hinds Myler hubs ST-1 STA-1 SSTG-1 STG-1 STAG-1 MHUB-1 HUB-1</p> <p>O-Z / Gedfrey Hubs CHM-50DT CHMG-50DT</p> <p>Killark Glands CMCXAA050 MCR050 MCX050</p>

11. In addition to the supplied bonding plate, when metallic 2 or 3 glands or conduit hubs are fitted to a BA454D Batch Controller, all metallic glands or conduit hubs must be connected together and grounded.
12. **WARNING:** The BA454D and BA458C Batch Controllers are manufactured from conductive plastic per Article 250 of the National Electrical Code or Section 10 of the Canadian Electrical Code as applicable. The enclosures shall be grounded using the 'E' terminal on the terminal block.
13. Input connections shall only be made to terminals 11 and 12 (INPUT 1), or to terminals 13, 14, 15, 16 and 17 (INPUT 2). These inputs shall not be used at the same time.
14. The terminals for the power supply, Input A or Input B, External Links, External Switches, and optional alarms are all considered to be different intrinsically safe circuits and shall be wired separately as required by the National Electrical Code or Canadian Electrical Code as applicable.

Iss.		Date		Title	Drawn	Checked	Scale
1		26.03 2008		FM Approvals Control Drawing for intrinsically safe BA454D & BA458C Batch Controller	RC	<i>MMH</i>	NTS
					Drawing No.	CI450-12	
					Sheet 4		



THIRD ANGLE PROJECTION

DIMENSIONS IN mm

DO NOT SCALE

HAZARDOUS (CLASSIFIED) LOCATION

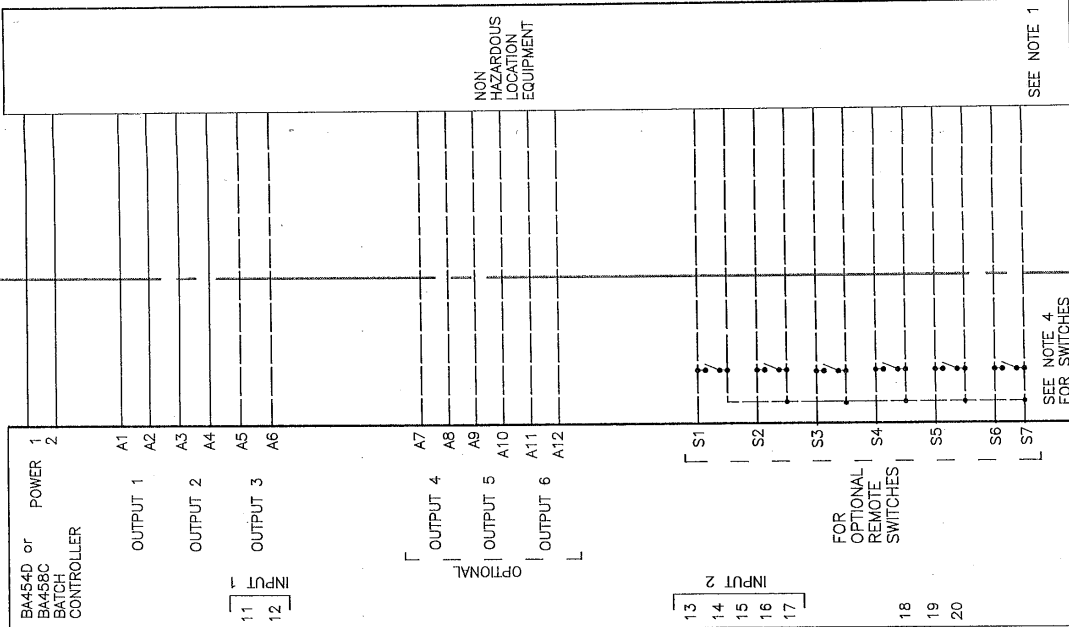
- BA454D LOCATIONS:**
 Class I, Division 2, Groups A, B, C, D
 Class II, Division 2, Groups E, F & G
 Class III
 Class I, Zone 2, Group IIC
- BA458C LOCATIONS:**
 Class I, Division 2, Groups A, B, C, D
 Class I, Zone 2, Group IIC

**BA454D and BA458C
Maximum input and
output parameters**

- Terminals 1 & 2
 $V_{max} = 28V$
 $C_i = 15nF$
 $L_i = 8\mu H$
- Terminals S1 to S7
 (combined parameters)
 $V_{max} = 0$
 $V_{oc} = 14.7V$ dc
 $I_{sc} = 146.7mA$
 $C_o = 0.08\mu F$
 $L_o = 1.1mH$
- Terminals A1 & A2; A3 & A4;
 A5 & A6; A7 & A8; A9 & A10;
 A11 & A12 (for each output)
 $V_{max} = 32V$ dc
 $C_i = 0.04\mu F$
 $L_i = 0.02mH$
- Terminals 11 & 12
 $V_{oc} = 10.6V$
 $I_{sc} = 20mA$
 $C_o = 2.3\mu F$
 $L_o = 90mH$
- Terminals 13, 14, 15, 16 & 17
 $V_{max} = 28V$ dc
 $C_i = 18nF$
 $L_i = 0.02mH$
- Terminals 18, 19 & 20
 $V_{oc} = 11.7V$ dc
 $I_{sc} = 2.4mA$
 $C_o = 1000\mu F$
 $L_o = 1000mH$

 ** NOTE:
 ** No modification to be made without
 ** reference/approval from FM Approvals
 ** and BEKA associates Design Department.*

SEE NOTE 2



UNCLASSIFIED LOCATION

SUB-MASTER

SEE NOTE 1

SEE NOTE 4
FOR SWITCHES

INPUT IN HAZARDOUS (CLASSIFIED) LOCATION

Iss.	26.03 2008	First release	Ktd.	Appd.
	1			
Title			FM Approvals Control Drawing for nonincendiive BA454D & BA458C Batch Controller	
Company			 Hitchin England company confidential, copyright reserved.	
Drawn	SH	Checked	Scale	NTS
Drawing No.			CI450-13	
Sheet 1 of 3				

SUB-MASTER

Note: No modification to be made without
reference/approval from FM Approvals and
BEKA associates Design Department.

Notes:

1. The unclassified location equipment connected to the associated nonincendive field wiring apparatus must not use or generate more than 250V rms or 250V dc.
2. Nonincendive field wiring installations shall be in accordance with the National Electrical Code ANSI/NFPA 70. The Nonincendive Field Wiring concept allows interconnection of Nonincendive Field Wiring Apparatus with Associated Nonincendive Field Wiring Apparatus using any of the wiring methods permitted for unclassified locations. Installations in Canada shall be in accordance with Canadian Electrical Code C22.2

3. Apparatus connected to the outputs shall be FM, cFM or CSA Approved as Associated Nonincendive Field Wiring Apparatus and shall comply with the following requirements:

Voc	equal to or less than	Vmax
La	equal to or greater than	Lcable + Li
Ca	equal to or greater than	Ccable + Ci

4. Terminals S1 to S7 shall be connected to simple apparatus or volt free contacts of FM, cFM or CSA Approved Nonincendive Field Wiring Apparatus or FM, cFM or CSA Approved Associated Nonincendive Field Wiring Apparatus installed using Division 2 wiring methods.

5. To maintain IP66 protection between the BA458C and the mounting panel:

Four panel mounting clips shall be used

Minimum panel thickness shall be 2mm (0.08inches) Steel
 3mm (0.12inches) Aluminium

Outside panel finish shall be smooth, free from particle inclusions, runs or build-up around cut-out.

Panel cut-out shall be 66.2 x 136.0mm -0.0 +0.5
 (2.60 x 5.35 inches -0.00 +0.02)

Edges of panel cut-out shall be deburred and clean

Each panel mounting clip shall be
tightened to between: 20 and 22cNm (1.77 to 1.95 inLb)

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1	04 2008	First release					

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Title	FM Approvals Control Drawing for nonincendive BA454D & BA458C Batch Controller	Drawn	Checked	Scale	
		RC		NTS	
Iss.	1	Date	04 2008	Drawing No.	CI450-13
				Sheet 2	

SUB-MASTER

6. When installed in a hazardous (classified) location the BA454D Batch Controller shall be fitted with cable glands / conduit hubs selected from the following table.

Metallic glands and hubs must be grounded - see note 7.

Class	Permitted gland or conduit hub
Class I	Any metallic or plastic cable gland or conduit hub that provides the required environmental protection.
Class II and III	<p>Crouse - Hinds Myler hubs SSTG-1 STG-1 STAG-1 MHUB-1</p> <p>O-Z / Gedfrey hub CHMG-50DT</p> <p>REMKE hub WH-1-G</p> <p>Killark Glands CMCXAA050 MCR050 MCX050</p>

7. In addition to the supplied bonding plate, when 2 or 3 metallic glands or conduit hubs are fitted to a BA454D Batch Controller, all metallic glands or conduit hubs must be connected together and grounded.
8. CAUTION: The BA454D and BA458C Batch Controller enclosures are manufactured from conductive plastic per Article 250 of the National Electrical Code the enclosures shall be grounded using the 'E' terminal on the terminal block.
9. Input connections shall only be made to terminals 11 and 12 (INPUT 1), or to terminals 13, 14, 15, 16 and 17 (INPUT 2). These inputs shall not be used at the same time.

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Iss.	Date	Modification	Ckd.	Appd.
1	04 2008	First release		

Title FM Approvals Control Drawing for nonincendive BA454D & BA458C Batch Controller	Drawn RC	Checked 	Scale NTS
		Drawing No. Sheet 3	CI450-13